

IN THE CLAIMS:

Please cancel Claims 2, 4, 7, 12, 23, 25, 28, 33, 45, 47, 51, 56, 58, and 67-82 without prejudice to or disclaimer of the subject matter recited therein.

Please amend Claims 1, 3, 5, 6, 8-11, 13-22, 24, 26, 27, 29-32, 34-44, 46, 49, 50, 52-55, 57, and 59-66 as follows. A marked-up copy of Claims 1, 3, 5, 6, 8-11, 13-22, 24, 26, 27, 29-32, 34-44, 46, 49, 50, 52-55, 57, and 59-66 showing the changes made thereto, is attached. Note that all the claims currently pending in this application, including those not presently being amended, have been reproduced below for the Examiner's convenience.

1. (Twice Amended) A developing device for developing an electrostatic latent image formed on an electrophotographic photosensitive member, said developing device being usable with a main assembly of an electrophotographic image forming apparatus, said developing device comprising:

a developing member for supplying a developer to the electrophotographic photosensitive member for developing the electrostatic latent image formed on said electrophotographic photosensitive member;

a first electrode disposed along a length of said developing member; and

a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said developing device is mounted to the main assembly of the electrophotographic image forming apparatus, wherein said second electrode is disposed along a length of said developing member;

wherein an electrical signal is generated in accordance with an electrostatic capacity between said first electrode and second electrode when said first electrode or second electrode is supplied with a voltage from the main assembly of said electrophotographic image forming apparatus, and is measured by the main assembly of the electrophotographic image forming apparatus to detect a remaining amount of the developer.

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3. (Amended) A device according to Claim 1, wherein said second electrode and a frame supporting said first electrode constitute a recess extending parallel to a developing device frame, wherein said recess opens downward.

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5. (Amended) A device according to Claim 3, wherein one and the other of said first and second electrodes are plate-like and rod-like electrodes.

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6. (Twice Amended) A developing device for developing an electrostatic latent image formed on an electrophotographic photosensitive member, said developing device being usable with a main assembly of an electrophotographic image forming apparatus, said developing device comprising:

a developing member for supplying a developer to said electrophotographic photosensitive member to develop the electrostatic latent image formed on said electrophotographic photosensitive member;

a first electrode disposed along a length of said developing member;

a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said developing device is mounted to the main assembly of the electrophotographic image forming apparatus, wherein said second electrode is disposed along a length of said developing member;

a third electrode disposed between said first electrode and said developing member;

a first electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said first electrode when said developing device is mounted to the main assembly of said electrophotographic image forming apparatus;

a second electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said developing member

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when said developing device is mounted to the main assembly of said electrophotographic image forming apparatus; and

a third electrical contact for transmitting, to the main assembly of said electrophotographic image forming apparatus, an electrical signal corresponding at least to electrostatic capacities between said first electrode and second electrode and between said developing member and said third electrode, when the voltages are applied to said first electrode and to said developing member, to detect a remaining amount of the developer by the main assembly of the electrophotographic image forming apparatus.

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8. (Twice Amended) A device according to Claim 6, wherein said second electrode and a frame supporting said first electrode constitute a recess extending parallel to said developing member, said recess opening downward.

9. (Twice Amended) A device according to Claim 6 or 8, wherein said third electrode is a member which is integral with or separate from said first electrode, and is disposed along a length of said developing member.

10. (Twice Amended) A device according to Claim 9, further comprising a developer chamber having an opening in which said developing member is supported, and a developer container, connected with said developer chamber, for accommodating the developer, wherein said first, second and third electrodes are provided in said developer chamber.

11. (Twice Amended) A device according to Claim 1 or 6, further comprising developer stirring means for stirring the developer, wherein at least said first and second electrodes are disposed in a moving range of the developer provided by rotation of said developer stirring means.

13. (Twice Amended) A developing device for developing an electrostatic latent image formed on an electrophotographic photosensitive member, said developing device being usable with a main assembly of an electrophotographic image forming apparatus, said developing device comprising:

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a developing member for supplying a developer to said electrophotographic photosensitive member to develop the electrostatic latent image formed on said electrophotographic photosensitive member;

a first electrode provided so as to exhibit the same potential as said developing member;
a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said developing device is mounted to the main assembly of the electrophotographic image forming apparatus;

a developer path electrode disposed along a path along which the developer accommodated in a developer accommodating portion moves to said developing member;

a first electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said first electrode when said developing device is mounted to the main assembly of said electrophotographic image forming apparatus;

a second electric contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said developing member when said developing device is mounted to the main assembly of said electrophotographic image forming apparatus; and

a third electrical contact for transmitting, to the main assembly of the electrophotographic image forming apparatus, an electrical signal corresponding to electrostatic capacities at least between said first electrode and said second electrode and between said developing member and said developer path electrode to detect a remaining amount of the developer by the main assembly of the electrophotographic image forming apparatus.

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14. (Amended) A device according to Claim 13, wherein said developer path electrode is in the form of a plate extending along the path.

15. (Amended) A device according to Claim 13, further comprising a third electrode provided between said first electrode and said developing member.

16. (Amended) A device according to Claim 15, wherein said third electrode is a member which is integral with or separate from said first electrode, and is disposed along a length of said developing member.

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17. (Twice Amended) A device according to Claim 13 or 16, wherein said first electrode and said second electrode are arranged along a length of said developing member which is in the form of a developing roller.

18. (Twice Amended) A device according to Claim 13, wherein said second electrode and a frame supporting said first electrode constitute a recess extending parallel to said developing member, said recess opening downward.

19. (Twice Amended) A device according to Claim 13, further comprising an intermediary electrode between said developing member and said developer path electrode.

20. (Twice Amended) A device according to Claim 13 or 16, further comprising developer stirring means for stirring the developer, wherein at least said first electrode and second electrode are disposed in a moving range of the developer provided by rotation of said developer stirring means.

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21. (Amended) A device according to Claim 1, 6 or 13, further comprising a stirring member for stirring the developer accommodated therein, wherein at least a lower end of said second electrode takes a position above said first electrode in a direction of movement of the developer provided by said stirring member, when said developing device is mounted to the main assembly of the electrophotographic image forming apparatus.

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22. (Twice Amended) A process cartridge detachably mountable to a main assembly of an electrophotographic image forming apparatus, comprising:

(a) an electrophotographic photosensitive member;

(b) a developing device including:

a developing member for supplying a developer to said electrophotographic photosensitive member to develop an electrostatic latent image formed on said electrophotographic photosensitive member;

a first electrode disposed along a length of said developing member; and

a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said process cartridge is mounted to the main assembly of the electrophotographic image forming apparatus, wherein said second electrode is disposed along a length of said developing member,

wherein an electrical signal is generated in accordance with an electrostatic capacity between said first electrode and second electrode when said first electrode or second electrode is supplied with a voltage from the main assembly of said electrophotographic image forming apparatus, and is measured by the main assembly of the electrophotographic image forming apparatus to detect a remaining amount of the developer.

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24. (Twice Amended) A process cartridge according to Claim 22, wherein said first electrode and a frame supporting said second electrode constitute a recess extending parallel to a developing device frame, said recess opening downward.

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26. (Amended) A process cartridge according to Claim 22 or 24, wherein one and the other of said first and second electrodes are plate-like and rod-like electrodes.

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27. (Twice Amended) A process cartridge detachably mountable to a main assembly of an electrophotographic image forming apparatus, comprising:

(a) an electrophotographic photosensitive member;

(b) a developing device including:

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a developing member for supplying a developer to said electrophotographic photosensitive member to develop an electrostatic latent image formed on said electrophotographic photosensitive member;

a first electrode disposed along a length of said developing member;

a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said process cartridge is mounted to the main assembly of the electrophotographic image forming apparatus, wherein said second electrode is disposed along a length said developing member;

a third electrode disposed between said first electrode and said developing member;

a first electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said first electrode when said process cartridge is mounted to the main assembly of said electrophotographic image forming apparatus;

a second electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said developing member

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when said process cartridge is mounted to the main assembly of said electrophotographic image forming apparatus; and

a third electrical contact for transmitting, to the main assembly of said electrophotographic image forming apparatus, an electrical signal corresponding at least to electrostatic capacities between said first electrode and second electrode and between said developing member and said third electrode, when the voltages are applied to said first electrode and to said developing member, to detect a remaining amount of the developer by the main assembly of the electrophotographic image forming apparatus.

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29. (Twice Amended) A process cartridge according to Claim 27, wherein said first electrode and a frame supporting said second electrode constitute a recess extending parallel to a developing device frame, said recess opening downward.

30. (Twice Amended) A process cartridge according to Claim 27 or 29, wherein said third electrode is a member which is integral with or separate from said second electrode, and is disposed opposed to said developing member.

31. (Twice Amended) A process cartridge according to Claim 30, further comprising a developer chamber having an opening in which said developing member is supported, and a developer container, connected with said developer chamber, for accommodating the developer, wherein said first, second and third electrodes are provided in said developer chamber.

32. (Twice Amended) A process cartridge according to Claim 27 or 29, further comprising developer stirring means for stirring the developer, wherein at least said first and second electrodes are disposed in a moving range of the developer provided by rotation of said developer stirring means.

34. (Amended) A process cartridge detachably mountable to a main assembly of an electrophotographic image forming apparatus, comprising:

(a) an electrophotographic photosensitive member; and

(b) a developing device including:

a developing member for supplying a developer to said electrophotographic photosensitive member to develop an electrostatic latent image formed on said electrophotographic photosensitive member;

a first electrode provided so as to exhibit the same potential as said developing member;

a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said process cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;

a developer path electrode disposed along a path along which the developer accommodated in a developer accommodating portion moves to said developing member;

a first electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said first electrode when said process cartridge is mounted to the main assembly of said electrophotographic image forming apparatus;

a second electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said developing member when said process cartridge is mounted to the main assembly of said electrophotographic image forming apparatus; and

a third electrical contact for transmitting, to the main assembly of the electrophotographic image forming apparatus, an electrical signal corresponding to electrostatic capacities at least between said first electrode and said second electrode and between said developing member and said developer path electrode to detect a remaining amount of the developer by the main assembly of the electrophotographic image forming apparatus.

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35. (Amended) A process cartridge according to Claim 34, wherein said developer path electrode is in the form of a plate extending along the path.

36. (Amended) A process cartridge according to Claim 34, further comprising a third electrode provided between said first electrode and said developing member.

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37. (Twice Amended) A process cartridge according to Claim 36, wherein said third electrode is a member which is integral with or separate from said first electrode, and is disposed along a length of said developing member.

38. (Twice Amended) A process cartridge according to Claim 34 or 37, wherein said first electrode and said second electrode are arranged along a length of said developing member which is in the form of a developing roller.

39. (Twice Amended) A process cartridge according to Claim 34 or 37, wherein said second electrode and a frame supporting said first electrode constitute a recess extending parallel to said developing member, and wherein said recess opens downward.

40. (Twice Amended) A process cartridge according to Claim 34, further comprising an intermediary electrode between said developing member and said developer path electrode.

41. (Twice Amended) A process cartridge according to Claim 34 or 37, further comprising developer stirring means for stirring the developer, wherein at least said first and second electrodes are disposed in a moving range of the developer provided by rotation of said developer stirring means.

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42. (Amended) A process cartridge according to Claim 22, 27 or 34, further comprising a stirring member for stirring the developer accommodated therein, wherein at least a lower end of said second electrode takes a position above said first electrode in a direction of movement of the developer provided by said stirring member, when said developing device is mounted to the main assembly of the electrophotographic image forming apparatus.

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43. (Twice Amended) An electrophotographic image forming apparatus for forming an image on a recording material, comprising:

- (a) an electrophotographic photosensitive member;
- (b) an electrostatic latent image forming means for forming an electrostatic latent image on said electrophotographic photosensitive member; and
- (c) a developing device for developing the electrostatic latent image formed on said electrophotographic photosensitive member, said developing device including:
 - a developing member for supplying ~~the~~ ^{to the} developer to said electrophotographic photosensitive member;
 - a first electrode disposed along a length of said developing member; and
 - a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said developing device is mounted to a main assembly of the electrophotographic image forming apparatus, wherein said second electrode is disposed along a length of said developing member;

wherein an electrical signal is generated in accordance with an electrostatic capacity between said first electrode and second electrode when said first electrode or second electrode is supplied with a voltage from the main assembly of said electrophotographic image forming apparatus, and is measured by the main assembly of the electrophotographic image forming apparatus to detect a remaining amount of the developer.

44. (Twice Amended) An electrophotographic image forming apparatus for forming an image on a recording material, wherein a process cartridge is detachably mountable to a main assembly of said electrophotographic image forming apparatus, said electrophotographic image forming apparatus comprising:

(a) mounting means for mounting the process cartridge, said process cartridge including:

an electrophotographic photosensitive member;

a developing member for supplying a developer to said electrophotographic photosensitive member to develop an electrostatic latent image formed on said electrophotographic photosensitive member;

a first electrode disposed along a length of said developing member; and

a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said process cartridge is mounted to the main assembly of the electrophotographic image forming apparatus, wherein said second electrode is disposed along a length of said developing member;

(b) electrostatic latent image forming means for forming the electrostatic latent image on said electrophotographic photosensitive member; and

(c) developer remaining amount detecting means for detecting a remaining amount of the developer by measuring an electrical signal which is produced by application of a voltage to said first electrode or second electrode and which corresponds to an electrostatic capacity

between said first electrode and second electrode.

46. (Twice Amended) A apparatus according to Claim 43 or 44, wherein said second electrode and a frame supporting said first electrode constitute a recess extending parallel to a developing device frame, said recess opening downward.

48. (Unamended) An apparatus according to Claim 43 or 44, wherein one and the other of said first and second electrodes are plate-like and rod-like electrodes.

49. (Twice Amended) An electrophotographic image forming apparatus for forming an image on a recording material, comprising:

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- (a) an electrophotographic photosensitive member;
 - (b) an electrostatic latent image forming means for forming an electrostatic latent image on said electrophotographic photosensitive member;
 - (c) a developing device for developing the electrostatic latent image formed on said electrophotographic photosensitive member, said developing device including:
 - a developing member for supplying a developer to said electrophotographic photosensitive member to develop the electrostatic latent image formed on said electrophotographic photosensitive member;
 - a first electrode disposed along a length of said developing member;
 - a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said developing device is mounted to a main assembly of the electrophotographic image forming apparatus, wherein said second electrode is disposed along a length of said developing member;
 - a third electrode disposed between said first electrode and said developing member;
 - a first electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said first electrode when said developing device is mounted to the main assembly of said electrophotographic image forming apparatus;
 - a second electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said developing member

when said developing device is mounted to the main assembly of said electrophotographic image forming apparatus; and

a third electrical contact for transmitting, to the main assembly of said electrophotographic image forming apparatus, an electrical signal corresponding at least to electrostatic capacities between said first electrode and second electrode and between said developing member and said third electrode, when the voltages are applied to said first electrode and to said developing member; and

(d) developer amount detecting means for detecting an amount of the developer in said developing device on the basis of the electrical signal transmitted from said third electrical contact.

50. (Twice Amended) An electrophotographic image forming apparatus for forming an image on a recording material, wherein a process cartridge is detachably mountable to a main assembly of said electrophotographic image forming apparatus, said electrophotographic image forming apparatus comprising:

(a) mounting means for detachably mounting the process cartridge, the process cartridge including:

an electrophotographic photosensitive member;

a developing member for supplying a developer to said electrophotographic photosensitive member to develop an electrostatic latent image formed on said electrophotographic photosensitive member;

a first electrode disposed opposed to said developing member;

a second electrode disposed such that at least a lower end thereof takes a position lower than said first electrode when said process cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;

a third electrode disposed between said second electrode and said developing member;

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a first electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said first electrode when ~~process cartridge~~ *developing device* said ~~developing device~~ is mounted to the main assembly of said electrophotographic image forming apparatus;

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a second electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said developing member when said ~~process cartridge~~ *developing device* ~~developing device~~ is mounted to the main assembly of said electrophotographic image forming apparatus; and

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a third electrical contact for transmitting, to the main assembly of said electrophotographic image forming apparatus, an electrical signal corresponding at least to electrostatic capacities between said first electrode and second electrode and between said developing member and said third electrode, when the voltages are applied to said first electrode and to said developing member, to detect a remaining amount of the developer by the main assembly of the electrophotographic image forming apparatus;

(b) electrostatic latent image forming means for forming the electrostatic latent image on said electrophotographic photosensitive member; and

(c) developer amount detecting means for detecting an amount of the developer in said ~~process cartridge~~ on the basis of the electrical signal transmitted from said third electrical contact.

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52. (Twice Amended) An apparatus according to Claim 49 or 50, wherein said second electrode and a frame supporting said first electrode constitute a recess extending parallel to said developing member, said recess opening downward.

53. (Twice Amended) An apparatus according to Claim 49 or 50, wherein said third electrode is a member which is integral with or separate from said first electrode, and is disposed along a length of said developing member.

54. (Twice Amended) An apparatus according to Claim 49 or 50, further comprising a developer chamber having an opening in which said developing member is supported, and a developer container, connected with said developer chamber, for accommodating the developer, wherein said first, second and third electrodes are provided in said developer chamber.

55. (Twice Amended) An apparatus according to Claim 43, 44, 49 or 50, further comprising developer stirring means for stirring the developer, wherein at least said first and second electrodes are disposed in a moving range of the developer provided by rotation of said developer stirring means.

57. (Twice Amended) An electrophotographic image forming apparatus for forming an image on a recording material, comprising:

(a) an electrophotographic photosensitive member;

(b) an electrostatic latent image forming means for forming an electrostatic latent image on said electrophotographic photosensitive member;

(c) a developing device for developing the electrostatic latent image formed on said electrophotographic photosensitive member, said developing device including:

a developing member for supplying a developer to said electrophotographic photosensitive member to develop the electrostatic latent image formed on said electrophotographic photosensitive member;

a first electrode provided so as to exhibit the same potential as said developing member;

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a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said developing device is mounted to a main assembly of the electrophotographic image forming apparatus;

a developer path electrode disposed along a path along which the developer accommodated in a developer accommodating portion moves to said developing member;

a first electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said first electrode when said developing device is mounted to the main assembly of said electrophotographic image forming apparatus;

a second electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said developing member when said developing device is mounted to the main assembly of said electrophotographic image forming apparatus; and

a third electrical contact for transmitting, to the main assembly of the electrophotographic image forming apparatus, an electrical signal corresponding to electrostatic capacities at least between said first electrode and said second electrode and between said developing member and said developer path electrode to detect a remaining amount of the developer by the main assembly of the electrophotographic image forming apparatus.

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59. (Twice Amended) An electrophotographic image forming apparatus for forming an image on a recording material, wherein a process cartridge is detachably mountable to a main assembly of said electrophotographic image forming apparatus, said electrophotographic image forming apparatus comprising:

(a) mounting means for detachably mounting the process cartridge, the process cartridge including:

an electrophotographic photosensitive member;

a developing member for supplying a developer to said electrophotographic photosensitive member to develop an electrostatic latent image formed on said electrophotographic photosensitive member;

a first electrode provided so as to exhibit the same potential as said developing member;

a second electrode disposed such that at least a lower end thereof takes a position above said first electrode when said process cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;

a developer path electrode disposed along a path along which the developer accommodated in a developer accommodating portion moves to said developing member;

a first electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said first electrode when said ~~process cartridge~~ developing device is mounted to the main assembly of said electrophotographic image forming apparatus;

a second electrical contact for receiving, from the main assembly of said electrophotographic image forming apparatus, a voltage to be applied to said developing member when said ~~process cartridge~~ developing device is mounted to the main assembly of said electrophotographic image forming apparatus; and

a third electrical contact for transmitting, to the main assembly of the electrophotographic image forming apparatus, an electrical signal corresponding to electrostatic capacities at least between said first electrode and said second electrode and between said developing member and said developer path electrode to detect a remaining amount of the developer by the main assembly of the electrophotographic image forming apparatus;

(b) electrostatic latent image forming means for forming the electrostatic latent image on said electrophotographic photosensitive member; and

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(c) developer amount detecting means for detecting an amount of the developer in said process cartridge on the basis of the electrical signal transmitted from said third electrical contact.

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60. (Amended) An apparatus according to Claim 57 or 59, wherein said developer path electrode is in the form of a plate extending along the path.

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61. (Twice Amended) An apparatus according to Claim 57 or 59, further comprising a third electrode provided between said first electrode and said developing member.

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62. (Amended) An apparatus according to Claim 61, wherein said third electrode is a member which is integral with or separate from said first electrode, and is disposed along a length of said developing member.

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63. (Twice Amended) An apparatus according to Claim 57 or 59, wherein said first electrode and said second electrode are arranged along a length of said developing member which is in the form of a developing roller.

64. (Twice Amended) An apparatus according to Claim 57 or 59, wherein said second electrode and a frame supporting said first electrode constitute a recess extending parallel to said developing member, and wherein said recess opens downward.

65. (Twice Amended) An apparatus according to Claim 57 or 59, further comprising an intermediary electrode between said developing member and said developer path electrode.

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66. (Twice Amended) An apparatus according to Claim 57 or 59, further comprising developer stirring means for stirring the developer, wherein at least said first electrode and second electrode are disposed in a moving range of the developer provided by rotation of said developer stirring means.

REMARKS

Summary of substantive patentability issues

The claims rejected over the Nakagawa, et al. patent have been canceled without prejudice and Applicants plan to submit a certified translation of the priority document to overcome the rejection of Claims 1-3, 6-10, 11/1, 11/2, 11/6, 11/7, 21/1, 21/6, 22-24, 27-31, 32/22, 32/23, 32/27, 32/28, 42/22, 42/27, 43, 44, 45/43, 45/44, 46/43, 46/44, 55/43, 55/44, 67-69, 72-74, and 77-80 over the patent to Karakama, et al. Therefore, are the claims allowable over these patents?

Status of the claims

Claims 1, 3, 5, 6, 8-11, 13-22, 24, 26, 27, 29-32, 34-44, 46, 49, 50, 52-55, 57, and 59-66 have been amended. Claims 2, 4, 7, 12, 23, 25, 28, 33, 45, 47, 51, 56, 58, and 67-82 have been canceled without prejudice. Accordingly, Claims 1, 3, 5, 6, 8-11, 13-22, 24, 26, 27, 29-32, 34-44, 46, 48-50, 52-55, 57, and 59-66 are pending. Claims 1, 6, 13, 22, 27, 34, 43, 44, 49, 50, 57, and 59 are independent.

Requested action

Applicants respectfully request the Examiner to reconsider and withdraw the outstanding objections and rejections in view of the foregoing amendments and the following remarks.